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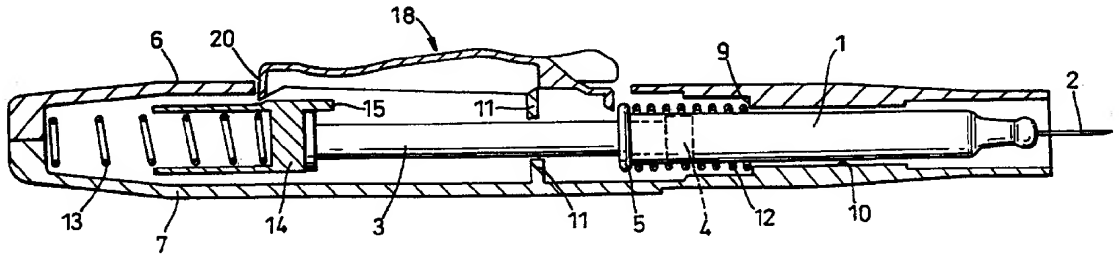

(57) Abstract

A one–shot throwaway injection device has a barrel (6, 7) that houses a syringe (1) initially in a retracted state held back by a trigger (18) against a drive spring (13). Actuation of the trigger causes the syringe to be thrust forwards by the spring acting on its plunger (3) until the needle (2) is fully projecting, and then the dose is ejected by the final expansion of the spring. Release of the trigger allows a return spring (12) to urge the syringe back and retract the needle. The barrel is a unitary plastics moulding of two longitudinally split halves (6, 7) hinged together with the trigger (18) integrally formed with one of these halves. The other components (the springs (12, 13) and the syringe (1)) are positioned in one half which is then closed up and fastened to the other half to complete the barrel.

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Improvements relating to Injection Devices

This invention relates to injection devices.

It concerns devices which are fitted with a syringe having a capsule with a needle projecting from the forward end and a plunger from the rear end. A trigger and spring mechanism, when operated, shoots the syringe forwardly to project the needle, and then continues to act on the plunger to eject the dose. There is also a return spring arrangement to retract the needle after use, thereby making it safe.

Hitherto, these firing devices have been quite complicated and expensive, and it is necessary to load and unload the syringe before and after use and to keep the device itself for repeated use. It is too expensive simply to throw away. Also there have been problems with ensuring that the return spring works properly.

However, unloading particularly has its dangers with a sharp and possibly contaminated needle, and it is the aim of this invention to provide an injection device which is simple and cheap enough to be thrown away with the syringe safely retracted inside it.

According to one aspect of the present invention there is provided an injector device for containing and operating a syringe having a capsule with a needle projecting from the forward end and a plunger from the rear end, the device having a first spring initially in a compressed energised state at the rear end of the device held by a trigger, and

a second spring initially not fully energised and surrounding the capsule, wherein operation of the trigger releases the first spring which first urges the syringe forwardly by acting on the plunger and thence through the dose within the syringe, and secondly, when the syringe reaches a needle projecting position, presses the plunger forwards relative to the capsule to eject the dose, and wherein the second spring, fully compressed by this action, then exerts itself to retract the syringe and its needle, characterised in that the device has an integrally moulded two-part body formed in an open state, the trigger also being part of the integral moulding, and in that the body is closed and secured around a dose filled syringe in the retracted position and the first and second coil springs.

Conveniently, the body is in two substantially semi-cylindrical halves, joined by at least one thin web along adjacent longitudinal edges.

Preferably the trigger is a portion separated from a respective half of the body by all but webs that form a transverse hinge at an intermediate position along the trigger. The rear end of the trigger may have an inward projection that initially maintains the first spring primed, release being by pressing inwardly on the forward end. This forward end may have a pawl to catch behind the capsule when the capsule reaches the needle projecting position, thereby to prevent retraction under the influence of the second spring as long as the forward end remains pressed inwardly or the trigger is operated positively to withdraw the pawl.

The trigger may be duplicated, with one on each half, these triggers being squeezed together to operate the device.

Generally, there will also be a separately moulded protective cap to fit over the forward end of the completed body. This cap is conveniently adapted to co-operate with the trigger to prevent that being operated while the cap is on. The cap can also have an internal formation that projects into the barrel to co-operate with a sheath initially provided over the needle of the capsule, removal of the cap causing the sheath to be pulled off the needle.

The cap may be refitted after use, to be thrown away with the injection device.

According to another aspect of the invention there is provided an injector device for containing and operating a syringe having a capsule with a needle projecting from the forward end and a plunger from the rear end, the device having a first spring initially in a compressed energised state at the rear end of the device held by a trigger, and a second spring initially not fully energised and surrounding the capsule, wherein operation of the trigger releases the first spring which first urges the syringe forwardly by acting on the plunger and thence through the dose within the syringe, and secondly, when the syringe reaches a needle projecting position, presses the plunger forwards relative to the capsule to eject the dose, and wherein the second spring, fully compressed by this action, then exerts itself to retract the syringe and its needle, characterised in that

the trigger is adapted to provide an obstruction to the syringe to prevent the retraction thereof as long as the trigger is maintained in its operated state, the retraction requiring release or an alternative operation of the trigger.

For a better understanding of the invention, one embodiment will now be described, by way of example, with reference to the accompanying drawings, in which:

Figures 1 - 4 are simplified axial sections of an injection device in various stages from initial assembly, through use to being ready for disposal,

Figure 5 is a plan view of the injection device,

Figure 6 is a perspective view of part of the device showing a trigger in more detail, and

Figure 7 is a perspective view of part of the device, with half of the barrel removed, showing a drive member and part of the inside of the trigger.

The injection device is designed to contain and operate a syringe having a capsule 1, a needle 2 at its forward end, and a plunger 3 at its rearward end which can actuate a piston 4 within the capsule to eject a dose through the needle 2. The rear end of the capsule has an outwardly projecting rim 5. This syringe is of known form.

The body of the injection device is formed by two generally semi-cylindrical halves 6 and 7 brought together and secured by adhesive or welding for example, or by snap-fitting lugs and sockets, to make a barrel with tapers at each end. The halves 6 and 7 are moulded in one piece in an

opened-out condition, being joined by a single long web, or several shorter webs 8. These extend along one pair of adjacent longitudinal edges of the halves 6 and 7 between the tapering ends, and serve as hinges when the halves are closed together.

Towards its forward end the body reduces internally at a shoulder 9 to a passage 10 which serves as a longitudinal guide for the capsule 1. At about the mid-length, there are internal ribs 11 non-obstructive to the piston 4 and the member described below which drives it but which form an abutment for the rim 5. A coil spring 12, initially only partially compressed, surrounds the capsule to act between the shoulder 9 and the out-turned rim 5. The forward end of the barrel is open for passage of the needle 2.

At the rear end the barrel is closed and provides a seat for another coil spring 13, initially compressed and nesting in the rearward facing cup of a slider 14 forming a drive member. The forward end of this slider bears against the rear end of the piston 4 and it has a finger 15 projecting forwardly to one side of that rear end and outside the cylindrical envelope of the spring 13. The slider 14 is prevented from rotating by wings 16 which run in internal grooves 17 along the barrel, these grooves being formed by rebates inside the edges of the halves 6 and 7 coming together when the device is closed up.

The half 6 of the barrel is formed with a trigger 18 of generally rectangular form extending lengthwise of the barrel. It is separated from the half 6 around most of its

periphery except for two short webs 19 at opposite sides in the region of the ribs 11. These webs form a transverse hinge, the plastics material of which the barrel is moulded allowing a certain flexible resilience. The rear end of the trigger 18 has an inwardly projecting abutment 20 against which the finger 15 initially bears. At the leading end of each trigger, as best seen in Figure 6, there is a finger pad 21 proud of the barrel, forward of which are two undercut parallel wings 22. Between these wings, and stepped down to the envelope of the barrel, there is a pawl 23 with a tooth 24 projecting inwardly at its forward end. The pawl can hinge about its rear end by virtue of the plastics construction. Another finger pad 25 is provided towards the rear of the trigger.

As supplied, this injection device has a cap 26 which fits closely over the forward portion of the barrel, as shown in outline in Figure 1. It has a rearward extension 27 to engage the undercuts below the wings 22 and over the back of the pawl 23. It is illustrated approaching this position in Figure 6. At the forward end, the cap may have an internal formation which extends inside the barrel and which engages behind the base of a needle sheath (not shown) in known manner.

In the Figure 1 position, the injector is inoperative, the trigger 18 being held against actuation by the extension 27 of the cap 26. The spring 12 is partially compressed and semi energised, and the spring 13 is fully compressed and therefore fully energised. When the device is to be used,

the cap is pulled off, this simultaneously freeing the trigger and removing the sheath.

The device is then applied against the skin of the patient and the finger pad 21 is pressed in as shown in Figure 2. This hinges the trigger 18 so that the abutment 20 is moved outwardly, clear of the finger 15, thus freeing the compressed spring 13. This expands and, through the slider 14 and the plunger 3, thrusts the syringe forwards.

The trigger action depresses the pawl 23 towards the syringe, where the tooth 24 might interfere with the spring 11. However, because of its flexibility, the pawl bends outwards and snaps over the rearward turns of the spring 12 and the rim 5. The spring 12 is slightly stiffer than the spring 13 over the intermediate and final parts of the latter's expansion, in order to ensure the return of the syringe, but the momentum of the forward thrust ensures that the spring 12 is fully compressed.

When that is achieved, the capsule 1 is arrested and the pawl 23 snaps back into alignment with the trigger for the tooth 24 to engage behind the rim 5 as shown in Figures 2 and 3. It may be long enough to remain engaged if the trigger 18 is released, or it may be short, requiring the finger pad 21 to be held down. In any event, the needle 2 is now fully projected, but the spring 13, no longer opposed by the spring 12, continues to expand and the plunger 3 presses the piston 4 forwards, ejecting the dose.

The device is then withdrawn from the patient and the finger pad 21 released if the device is a short tooth

version. The trigger 18 springs back to its initial position, the pawl 23 releasing from the rim 5. With a long tooth version, the user presses on the rear finger pad 25 to tilt the trigger back and release the pawl. The spring 12 can now exert itself and push the syringe back, retracting the needle 2 to the position of Figure 4. The cap 26 may then be refitted, and the device thrown away.

There is a risk that, when pulling off the cap 26, the user will hold the barrel in a manner that will squeeze the finger pad 21, thereby prematurely firing the device. To prevent this, the rim of the cap and the trigger may be so configured that pressure on the finger pad will prevent release of the cap. For example, the end of the extension 27 may be slightly out-turned and the undercuts of the wings 22 notched to receive the out-turned end. The user will, therefore, have to grip the barrel clear of the trigger, allowing the cap to snap free.

It will be understood that the barrel can have one or more windows, particularly in the forward part in order that the state and position of the syringe can be visually checked.

CLAIMS

1. An injector device for containing and operating a syringe having a capsule (1) with a needle (2) projecting from the forward end and a plunger (3) from the rear end, the device having a first spring (13) initially in a compressed energised state at the rear end of the device held by a trigger (18), and a second spring (12) initially not fully energised and surrounding the capsule (1), wherein operation of the trigger (18) releases the first spring (13) which first urges the syringe forwardly by acting on the plunger (3) and thence through the dose within the syringe, and secondly, when the syringe reaches a needle projecting position, presses the plunger (13) forwards relative to the capsule (1) to eject the dose, and wherein the second spring (12), fully compressed by this action, then exerts itself to retract the syringe and its needle, characterised in that the device has an integrally moulded two-part body (6, 7) formed in an open state, the trigger (18) also being part of the integral moulding, and in that the body is closed and secured around a dose filled syringe in the retracted position and the first and second coil springs (13, 12).

2. An injection device as claimed in Claim 1, characterised in that the body is in two substantially semi-cylindrical halves (6, 7), joined by at least one thin web (8) along adjacent longitudinal edges.

3. An injection device as claimed in Claim 1 or 2, characterised in that the trigger (18) is a portion separated from a respective half of the body by all but webs (19)

that form a transverse hinge at an intermediate position along the trigger.

4. An injection device as claimed in Claim 3, characterised in that the rear end of the trigger (18) has an inward projection (20) that initially maintains the first spring (13) primed, release being by pressing inwardly on the forward end (21).

5. An injection device as claimed in Claim 4, characterised in that the forward end of the trigger (18) has a pawl (23) to catch behind the capsule (1) when the capsule reaches the needle projecting position, thereby to prevent retraction under the influence of the second spring (12) as long as the forward end remains pressed inwardly or the trigger is operated positively to withdraw the pawl.

6. An injection device as claimed in any preceding claim, characterised in that the trigger (18) is duplicated, with one on each half, these triggers being squeezed together to operate the device.

7. An injection device as claimed in any preceding claim, and further comprising a separately moulded protective cap (26) to fit over the forward end of the completed body.

8. An injection device as claimed in Claim 7, characterised in that the cap (26) is adapted to co-operate with the trigger (18) to prevent that being operated while the cap is on.

9. An injection device as claimed in Claim 7 or 8, characterised in that the cap has an internal formation that

projects into the barrel to co-operate with a sheath initially provided over the needle of the capsule, removal of the cap causing the sheath to be pulled off the needle.

10. An injector device for containing and operating a syringe having a capsule (1) with a needle (2) projecting from the forward end and a plunger (3) from the rear end, the device having a first spring (13) initially in a compressed energised state at the rear end of the device held by a trigger (18), and a second spring (12) initially not fully energised and surrounding the capsule (1), wherein operation of the trigger (18) releases the first spring (13) which first urges the syringe forwardly by acting on the plunger (3) and thence through the dose within the syringe, and secondly, when the syringe reaches a needle projecting position, presses the plunger (13) forwards relative to the capsule (1) to eject the dose, and wherein the second spring (12), fully compressed by this action, then exerts itself to retract the syringe and its needle, characterised in that the trigger (18) is adapted to provide an obstruction (24) to the syringe (1) to prevent the retraction thereof as long as the trigger is maintained in its operated state, the retraction requiring release or an alternative operation of the trigger.

11. An injection device as claimed in Claim 10 with any one or more features from any one of Claims 1 to 9.

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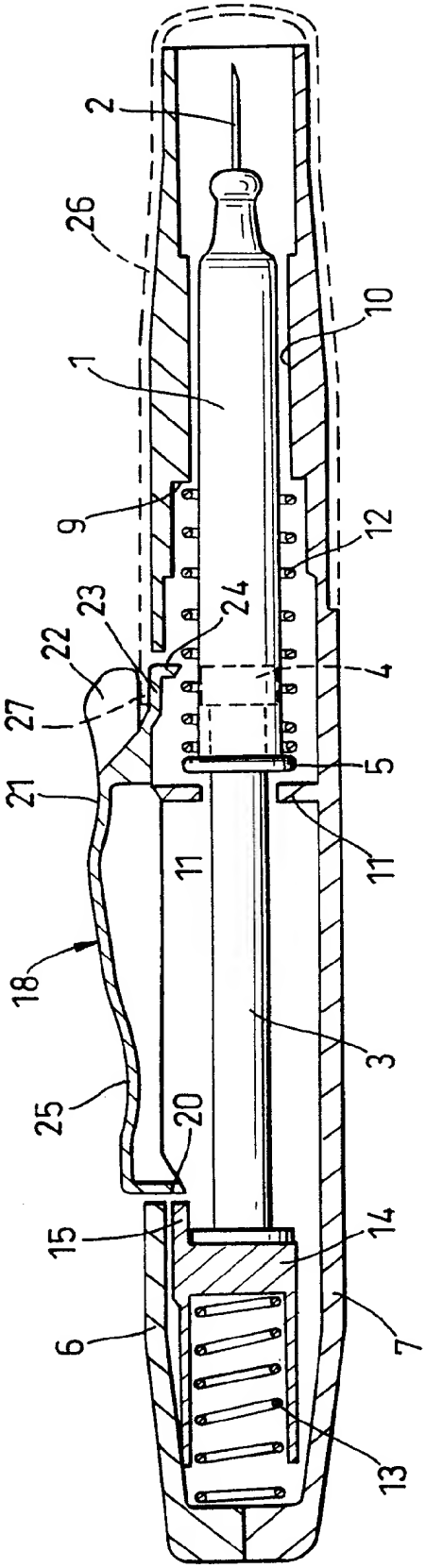
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Fig. 1

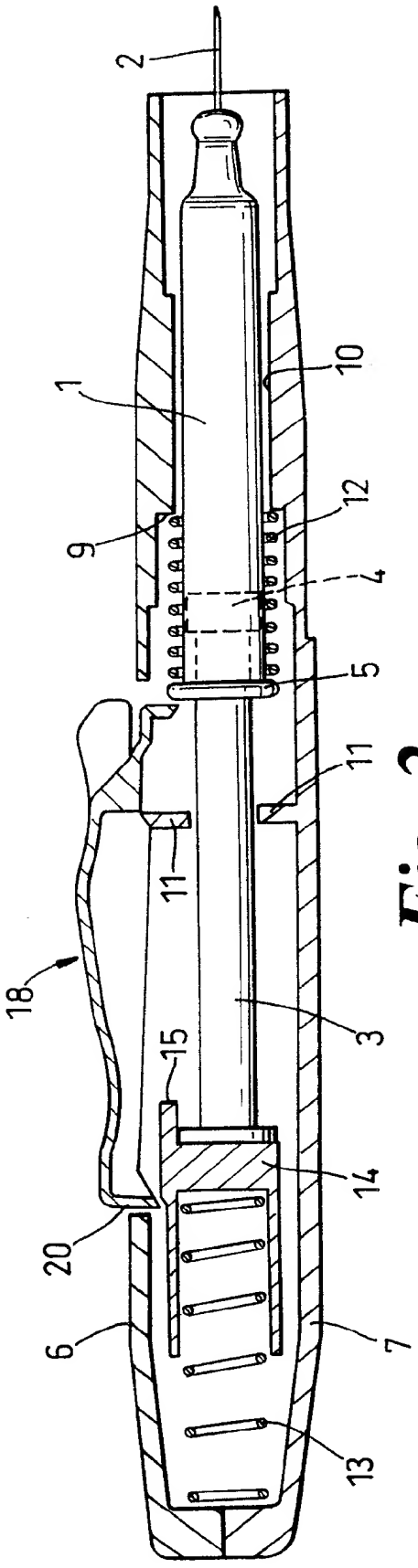
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Fig. 2

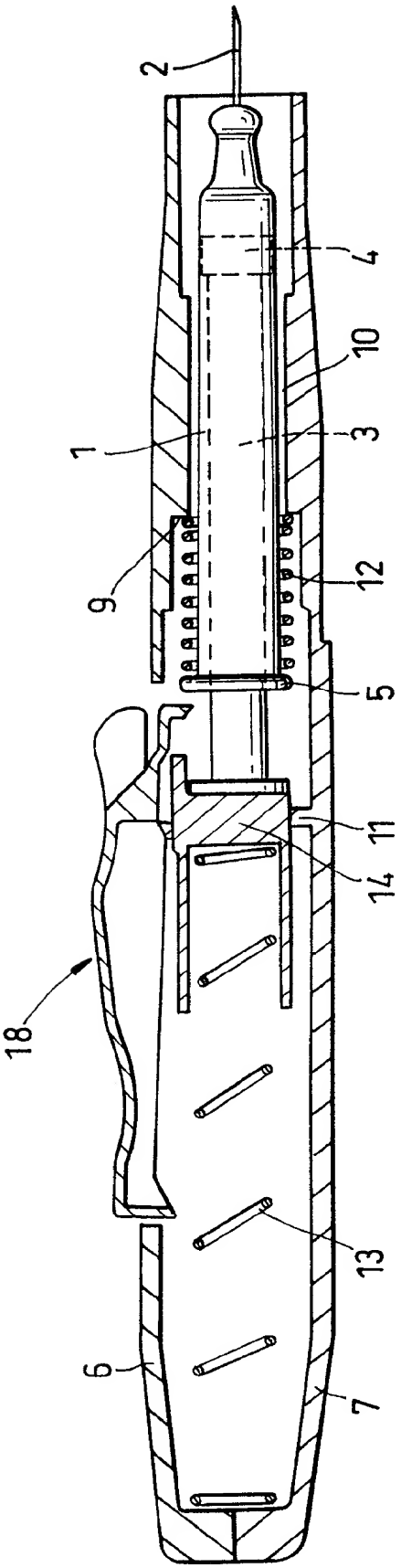

Fig. 3

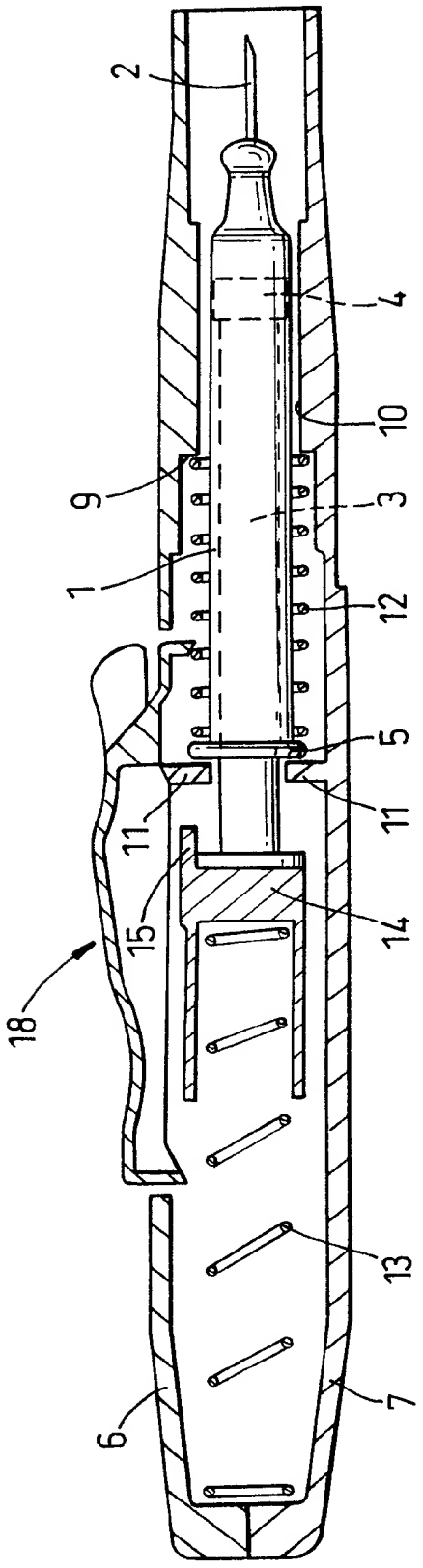

Fig. 4

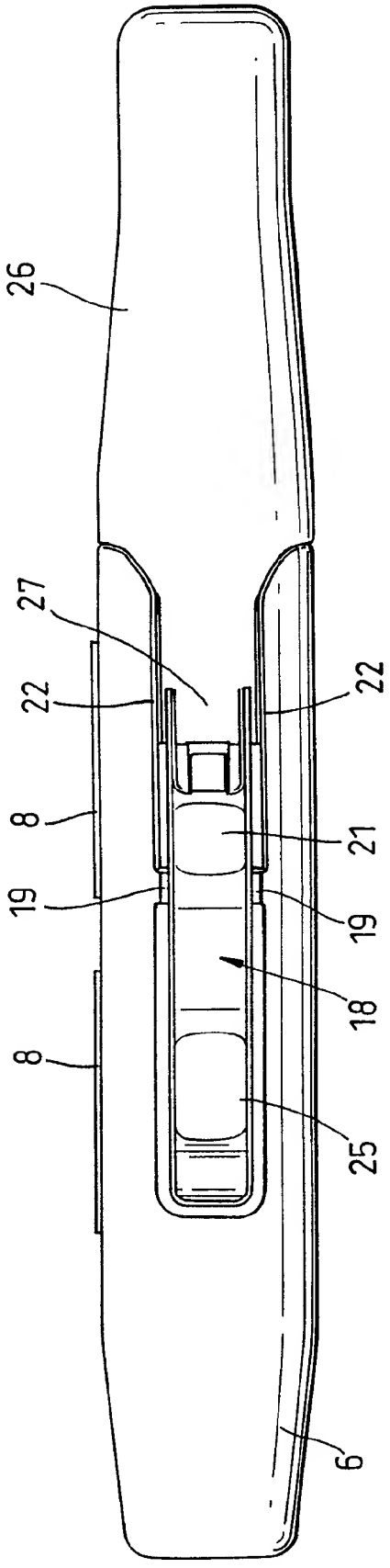

Fig. 5

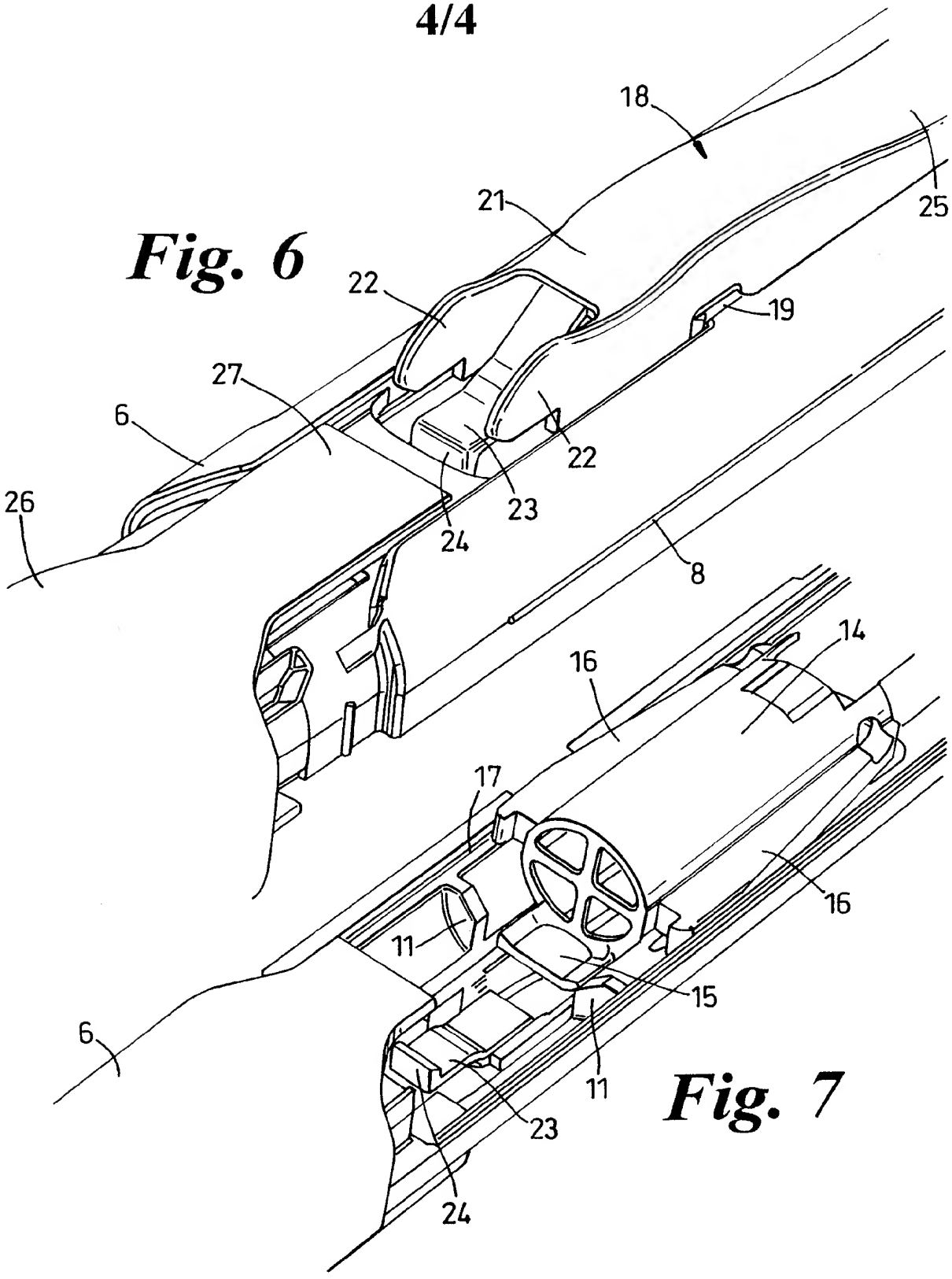

Fig. 6

Fig. 7